

Title Effect of low-temperature stress on abscisic acid, jasmonates, and polyamines in apples
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Abstract

The effect of low temperatures on polyamines, jasmonates, abscisic acid (ABA), and antioxidant activities was investigated in apple fruitlets. Although endogenous ABA concentrations were not significantly different between untreated control fruit kept at -2°C and those kept at 20°C , endogenous jasmonic acid (JA), putrescine, and spermidin concentrations at -2°C were generally higher than those at 20°C . Endogenous ABA concentrations increased in *n*-propyl dihydrojasmonate (PDJ)—or spermine-treated fruit in comparison to the untreated control at 20 and -2°C . The applications of PDJ or spermine decreased low-temperature injuries such as splitting and spotting in fruit. Although the IC_{50} of 1,1-diphenyl-2-picrylhydrazyl (DPPH)-radical scavenging activities was not significantly different among the treatments, the IC_{50} of $\text{O}_2^{\cdot -}$ -scavenging activities in PDJ-treated or Spm-treated fruit at 5 days after the low-temperature treatment was lower than in the untreated control at 20 and -2°C . The expression of *MdCHS* increased in Spm-treated fruit. The concentrations of ascorbic acid, catechin, chlorogenic acid, epi-catechin, and phloridzin in Spm-treated fruit were higher than in the untreated control at -2 or 20°C . These facts suggest that ABA, jasmonates and polyamines may be associated with low-temperature stress tolerance in apple fruitlets.